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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/675,649	09/30/2003	Dmitry N. Budnikov	ITL.0991US (P16413)	5825

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EXAMINER	
LAO, LUN S	

ART UNIT	PAPER NUMBER
2615	

MAIL DATE	DELIVERY MODE
10/31/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/675,649	BUDNIKOV ET AL.	
	Examiner	Art Unit	
	Lun-See Lao	2615	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 August 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-9,11-17 and 19-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-9,11-17 and 19-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. This action is in response to the amendment filed on 10-22-2007. Claims 1, 3, 9, 11, 17,19 and 29 have been amended and claims 2, 10 and 18 have been canceled. Claims 1,3-9,11-17 and 19-30 are pending.

Claim Objections

2. Claims 12 and 15 are objected to because of the following informalities: claims 12 and 15 recited "in claim 10" on line 1, which appears to be ---in claim 9 ---. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 17, 20, 22-23 and 29-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Higgins et al. (US PAT. 6,266,633).

Consider claim 17, Higgins teaches an article comprising a machine-readable storage medium containing instructions that, if executed, enable a system to:

divide (see fig.2A (60)) an input signal into a plurality of time-domain windows;

transform each of the time-domain windows (50 (reads on frames) and see col. 7 line 9-16) into the frequency domain (60, FTT) so as to create a plurality of frequency-transformed windows; select (see fig.1 (26)) frequency-transformed windows for processing in accordance with one or more source images (see col. 5 line 40-col.6 line 42 and see figs 2A-2C and col. 6 line 4-col. 7 line 67);

process the selected (see fig.1 (26)) ones of the frequency-transformed windows;

combine (see fig.2A(60)) the processed frequency-transformed windows to form a frequency-domain resultant (60, FTT); and convert the frequency-domain resultant into a time- domain resultant (140, IFFT and see col. 5 line 40-col. 6 line 42).

Consider claim 20, Higgins further teaches enabling the system to filter (see fig. 2A(63)) the frequency-transformed window in accordance with parameters that are derived from the source image (see col. 6 line 4-42).

Consider claim 22, Higgins teaches a spatial audio rendering engine comprising:

an input stage (see fig.1 (18)) to divide (see fig.2A (60)) an input signal into timewise-overlapping windows (reads on frames overlapping);

a transform module (FFT) to transform each of the timewise-overlapping windows into a frequency-transformed window;

a plurality of source image processing kernels (see fig. 2A (63) and fig. 2B), each of the kernels to process a transformed window in accordance with parameters corresponding to a source image (see col. 6 line 43-col. 7 line 27); and

an inverse transform module (IFFT) coupled to the source image processing kernels (63) to provide a time-domain signal derived from frequency-transformed windows processed by the processing kernels (see col. 5 line 40-col. 6 line 42).

Consider claim 23 Higgins teaches that the source image processing kernels are constructed to process selected (see fig.1 (26)) frequency-transformed windows in accordance with filter functions that correspond to respective ones of the source images (see col. 5 line 40-col. 6 line 42).

Consider claim 29, Higgins teaches a system comprising: a spatial audio rendering engine comprising:

an input stage (see fig.1 (18)) to couple to a source of input signals and to divide (see fig.2A (60)) an input signal into timewise-overlapping windows (reads on frames overlapping);

a frequency transform module (FFT) coupled to the input stage to transform each of the timewise-overlapping windows into a respective frequency-transformed window; and

a processor to select (fig.1 (26A)) frequency-transformed windows and to filter each of the selected frequency-transformed windows in accordance with a respective filter (see fig. 2A) so as to produce a filtered frequency-transformed window processed in accordance with one or more source images (see col. 5 line 40-col. 6 line 42); and an audio display device (reads on the computer monitor and see col. 4 line 46-col.5 line 14).

Consider claim 30, Higgins teaches the system further comprising: a buffer coupled to the frequency transform module to store respective ones of the frequency-transformed windows (see figs 2A-2B and see col. 5 line 40-col. 6 line 42).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 4-8, 9, 11-16, 19, 21 and 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins et al. (US PAT. 6,266,633) in view of Cashion (US PAT. 6,195,434).

Consider claim 1, Higgins teaches a method comprising:

dividing an input signal into a plurality of time- overlapping windows (reads on frames overlapping (see col. 6 line 20-25 and see fig. 2A(60))); transforming time-overlapping windows so as to create a plurality of frequency-transformed windows (f0-f511); processing selected (see fig.1 (processor 26)) ones of the frequency-transformed windows;

adding processed frequency-transformed windows to form a frequency-domain resultant (FFT); and converting the frequency-domain resultant into a time- domain resultant (IFFT) (see fig. 2A(140) and see col. 5 line 40-col. 6 line 42); but Higgins does not explicitly teach selecting frequency-transformed windows for processing in

accordance with reverberation paths, wherein each of the reverberation paths is associated with a respective delay.

However, Cashion teaches selecting (see fig. 2A (36)) frequency-transformed windows for processing in accordance with reverberation paths, wherein each of the reverberation paths is associated with a respective delay (see col.5 line 13-col. 6 line 42).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Cashion into Higgins to provide an apparatus for creating three dimensional audio imaging during playback over headphones using a binaural synthesis approach.

Consider claims 4-5, Higgins as modified (Cashion) teaches processing selected (see fig.2A (36) and see col.3 line 34-col. 4 line 44) ones of the frequency-transformed windows comprises applying a first filter (see fig. 2B(96,98)) that corresponds to a reverberation path (see col.6 line 30-col. 7 line 15 and see the discussion above claim 2); and the first filter (see fig. 2B(96,98)) effects a frequency-dependent attenuation that corresponds to a respective reverberation path (see col.6 line 30-col. 7 line 15).

Consider claims 6-8, Cashion teaches a method of the processing selected (see fig. 2A(26)) ones of the frequency-transformed windows further comprises applying a head-related transfer function (see col.5 line 13-col. 6 line 42); and the head-related transfer function corresponds to a respective reverberation path (see col.5 line 13-col. 6 line 42); and the head-related transfer function corresponds to positional coordinates of the reverberation path (see col. 6 line 39-col. 7 line 15).

Consider claim 9, Higgins teaches an apparatus comprising:

an input stage (see fig.1 (18)) to couple to a source of input signals and to divide (see fig.2 A (60)) an input signal into timewise-overlapping windows (reads on frames overlapping);

a frequency transform module (see fig. 2A (60)) coupled to the input stage to transform each of the timewise-overlapping windows into a respective frequency-transformed window; and

a processor (see fig. 1 (26)) to select frequency-transformed windows and to filter each of the selected windows in accordance with a respective filter (see fig. 2A(60)) so as to produce a filtered frequency-transformed window (see col. 5 line 40-col. 6 line 42); but Higgins does not explicitly teach that the processor selects frequency-transformed windows by matching a frequency-transformed window to a source image.

However, Cashion teaches the processor (see fig. 2A(36)) is adapted to select frequency-transformed windows by matching a frequency-transformed window to a source image (see fig.5 and col. 9 line 9-54).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Cashion into Higgins to provide an apparatus for processing audio signals for playback over headphones in which an apparent sound location can be smoothly panned over a number of locations without requiring an complex circuit.

Consider claims 11-12, Cashion teaches a source image corresponds to a reverberation path of an audio signal (see col. 8 line 9-54); and a table (see fig.2A (36))

to store a plurality of transfer functions, each of the transfer functions corresponding to at least one source image (see col.8 line 9-54).

Consider claims 13-14, Cashion teaches a source image corresponds to a reverberation path of an audio signal (see col.8 line 9-54) and each of the transfer functions is a head-response transfer function that corresponds to a reverberation path (see col. 5 line13-col. 6 line 38).

Consider claim 15 Higgins teaches an apparatus of further comprising:

a combiner (see fig. 2A(140) coupled to the processor to receive a plurality of the frequency-transformed windows (63) and to provide combined windows at an output; and an inverse frequency transform module (IFFT (140)) coupled to an output of the combiner to transform combined windows into the time domain (IFFT and see col. 6 line 4-42).

Consider claim 16, Cashion teaches that the processor comprises a plurality of source-image processors, wherein each source-image processor:

(i) is coupled to receive a frequency-transformed window that is matched to a respective source image (see col. 9 line 23-38);

(ii) is coupled to the table (see fig. 2A(36)) to receive a transfer function associated with a respective source image; and

(iii) is coupled to receive filter (see fig. 2B(46-52)) coefficients that correspond to the respective source image (see col.5 line 13-col. 6 line 65).

Consider claim 19, Higgins fails to teach selecting frequency-transformed windows for processing by matching a frequency-transformed window to a delay corresponding to a respective source image.

However, Cashion teaches selecting (see fig. 2A, (36)) frequency-transformed windows for processing by matching a frequency-transformed window to a delay corresponding to a respective source image (see fig.5 and col. 9 line 9-54).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Cashion into Higgins to provide an apparatus for processing audio signals for playback over headphones in which an apparent sound location can be smoothly panned over a number of locations without requiring an complex circuit.

Consider claim 21, Higgins fails to teach filtering the frequency-transformed window in accordance with a Head Response Transfer Function that corresponds to the source image.

However, Cashion teaches filtering the frequency-transformed window in accordance with a Head Response Transfer Function that corresponds to the source image (see col.5 line 13-col. 6 line 42).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Cashion into Higgins to provide an apparatus for creating three dimensional audio imaging during playback over headphones using a binaural synthesis approach.

Consider claim 24, Higgins fails to teaches a spatial audio rendering engine of further comprising a plurality of Head Related Transfer Functions to selectably coupled to respective ones of the source image processing kernels for filtering a transformed windows in a manner that simulates the response of a human ear to the respective source image provided to an audio display device.

However, Cashion teaches a spatial audio rendering engine of further comprising a plurality of Head Related Transfer Functions (see fig. 2B (50,52)) to selectably coupled to respective ones of the source image processing kernels for filtering a transformed windows in a manner that simulates the response of a human ear to the respective source image provided to an audio display device(see col.5 line 13-col. 6 line 42 and abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Cashion into Higgins to provide an apparatus for creating three dimensional audio imaging during playback over headphones using a binaural synthesis approach.

Consider claim 25, Cashion teaches that the source image processing kernels are constructed to process frequency-transformed windows that are time-delay matched to respective source images (see fig.5 and col. 9 line 9-54 and see the discussion above claim 24).

Consider claims 26-28, Higgins teaches a spatial audio rendering engine of further comprising: a signal combiner (see fig.2A (160)) coupled to outputs of source image processing kernels to provide an output window representing a combination (160) of the

outputs of the source image processing kernels (63 and see col. 6 line 4-42); and a spatial audio rendering engine of further comprising: an inverse transform module (see fig. 2A, (160)) coupled to the signal combiner to transform the output window signal to a time-domain signal (IFFT and see col. 6 line 4-42); and an interleave module (see fig.1 (20)) coupled to the inverse transform module (se fig.2A(160)) to provide an output signal to an audio display device(see col. 5 line 40-col. 6 line 42).

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins et al (US PAT. 6,266,633) as modified by Cashion (US PAT. 6,195,434) as applied to claims 1-2 above, and further in view of Gross (US PAT. 4,215,242).

Consider claim 3, Higgins and Cashion do not explicitly teach that method of further comprising: selecting a frequency-transformed window that incorporates a time shift that is closest to the delay to the reverberation path.

However, Gross teaches selecting a frequency-transformed window that incorporates a time shift that is closest (shortest) to the delay to the reverberation path (see col.2 line 20-41).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Gross into the teaching of Cashion and Higgins to provide a smoothly decaying reverberation signal.

Response to Arguments

8. Applicant's arguments filed 08-09-2007 have been fully considered but they are not persuasive.

Applicant argued that the passages of Cashion cited and, particularly, Figure 2A, item 36, and column 5, line 13 through column 6, line 42, does not teach selecting frequency transformed windows. (Remarks, page 7, second paragraph).

The examiner respectfully disagrees. Cashion teaches selecting frequency transformed windows and the effect of delay in sound locality (see fig 2A, 39 (to range control) and col. 3 line 13-col.4 line 44). Further, it would be obvious to combine Higgins and Cashion because they both relate to transfer functions in an audio system.

Applicant argued that Cashion does not teach frequency transformed windows (Remarks, page 7, last paragraph).

The examiner respectfully disagrees. Cashion teaches a finite impulse respond filter and a infinite impulse respond filter (see col. 5 line 50-67 and col.10 line 16-36), which meet the frequency transformed windows as claimed. Therefore, it meets a processor adapted to select frequency transformed windows by matching frequency transformed windows to source images, as recited in claim 1.

Applicant further argued that Higgins does not teach source images can be found (see Remarks, page 8, second paragraph).

The examiner respectfully disagrees. Higgins teaches selecting frequency-transformed windows for processing in accordance with one or more source images (see figs 2A-2C and col. 6 line 4-col. 7 line 67). Thus Higgins meets the limitation as recited in claim 17.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yoshida (US PAT. 7,054,808) is cited to show other related filtering for spatial audio rendering.

11. Any response to this action should be mailed to:

Mail Stop ____(explanation, e.g., Amendment or After-final, etc.)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Facsimile responses should be faxed to:
(571) 273-8300

Hand-delivered responses should be brought to:
Customer Service Window

Randolph Building
401 Dulany Street
Alexandria, VA 22314

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lao, Lun-See whose telephone number is (571) 272-7501 The examiner can normally be reached on Monday-Friday from 8:00 to 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chin Vivian, can be reached on (571) 272-7848.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 whose telephone number is (571) 272-2600.

Lao, Lun-See L.S.
Patent Examiner
US Patent and Trademark Office
Knox
571-272-7501

Date 10-26-2007

VIVIAN CHIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600